GLOBAL POSITIONING SYSTEMS WING (GPSW) PSEUDORANDOM NOISE (PRN) CODE ASSIGNMENT PROCESS

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Executive Summary

The Global Positioning System (GPS) is a U.S. space-based radionavigation system that provides reliable positioning, navigation, and timing services to civilian users on a continuous worldwide basis -- freely available to all. The United States Air Force (USAF) is the executive agent of the GPS and is directly responsible for acquiring, operating, and sustaining survivable, effective, and affordable global positioning services for its worldwide customers. The Global Positioning Systems Wing (GPSW) of the USAF is managed at the Space and Missile Systems Center (SMC), Air Force Space Command (AFSPC), and is responsible for developing, procuring, and sustaining GPS satellites, ground systems, and military user equipment.

With the advent of domestic and international GPS augmentation systems and other Global Navigation Satellite Systems (GNSS's), it has become critical to manage the issuance and use of GPS pseudorandom noise (PRN) codes to prevent unnecessary mutual interference. As part of its acquisition and sustainment effort for GPS, the GPSW is responsible for managing the issuance of GPS PRN sequences. For this purpose, a large set of GPS PRN sequences, that provide good auto- and cross-correlation properties, have been pre-selected and the selection and issuance of PRN codes will be done from this set.

The GPSW PRN Code Assignment Process document describes the process for requesting, assigning, and recording the GPS PRN numbers pre-selected and defined in GPS interface specifications IS-GPS-200 and IS-GPS-705. A formal request for a PRN number is initiated when the "Application for PRN Number Assignment" is submitted to the GPSW. Upon satisfactory review results, the GPSW will issue a PRN Number Assignment. The assignment may be either Preliminary (expires in 3 years) or Final (expires in 10 years) and the applicant may renew the assigned PRN number prior to the expiration. The lists of assigned and available PRN numbers along with the Application for PRN Number Assignment are found on the GPSW PRN Code Website at http://gps.losangeles.af.mil/prn/.

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1. **Scope**

   1.1. The purpose of this document is to describe the process for requesting, assigning, and recording the GPS pseudorandom noise (PRN) numbers defined in GPS interface specifications IS-GPS-200 and IS-GPS-705.

   1.2. The procedure described in this document applies to signals that use Coarse/Acquisition (C/A)-code, L2 Civil-Moderate (L2 CM)-code, L2 Civil-Long (L2 CL)-code, L5 In-Phase (L5 I5)-code, and L5 Quadrature-Phase (L5 Q5)-code defined in IS-GPS-200 and IS-GPS-705.

   1.3. The objectives of the GPSW PRN Code Assignment Process are (1) to serve as a single focal point for L1, L2, and L5 PRN code sequence assignments; (2) to prevent multiple assignments of the same PRN sequences; (3) to assign PRN sequences with compatible characteristics; and (4) to assign PRN sequences in a transparent manner.

   1.4. NOTE: Although the GPSW conducts an initial check on PRN number requests with respect to potential interference issues, the issuance of a PRN number does not convey authority to radiate in the band. The GPSW will explicitly communicate this point in both discussions with the applicant and in the GPSW PRN number assignment memo.

   1.5. In order to radiate in GPS L1, L2, and/or L5 band(s), the applicant shall obtain a frequency assignment from the national authority and, if the applicant will radiate from a satellite(s), the applicant shall register with the International Telecommunication Union (ITU). The specific frequency assignment process, ITU operator-to-operator coordination process, and radiation approval process are beyond the scope of this document.

2. **GPSW PRN Code Assignment Overview**

   2.1. Many domestic and international radionavigation systems, including satellite-based augmentation systems, seek high levels of interoperability with GPS, including the use of PRN sequences from the same spreading code families developed for GPS signals. Signals that employ PRN sequences from the GPS spreading code families achieve an established level of code performance, including good compatibility with all other signals using GPS codes. In addition, receivers can more readily generate and use all the spreading codes, thus fostering receivers that use all signals. The resulting compatibility and interoperability are mutually beneficial to all systems using GPS codes.

   2.2. The GPS spreading codes with a large number of optimized set of sequences have been developed and are listed in IS-GPS-200 and IS-GPS-705 (see http://gps.losangeles.af.mil/engineering/icwg/) for this purpose. The coordination process for new signals is simplified when these predefined set of sequences are used, compared to the more extensive set of evaluations and discussions that are needed if other sequences are being considered.

2.3. The following table lists the PRN numbers and their associated PRN allocations for C/A, L2C, and L5 PRN codes. PRN numbers available for assignment are found on the GPSW PRN Code Website at http://gps.losangeles.af.mil/prn/. The GPSW Systems Engineering Division (GPSW/EN) is the PRN code assignment process owner and maintains configuration control of these assignment documents.

Table 1: PRN Numbers and Their Associated PRN Allocations

PRN Number	PRN Allocations
C/A	
1 – 63	Reserved (GPS)
64 – 119	Ground Based Augmentation System & Other Augmentation Systems
120 – 158	Satellite Based Augmentation System
159 – 210	Other GNSS & Other Applications
L2C	
1 – 63	Reserved (GPS)
64 – 158	Not Available
159 – 210	Other GNSS & Other Applications
L5	
1 – 63	Reserved (GPS)
64 - 119	Unallocated
120 – 158	Satellite Based Augmentation System
159 – 210	Other GNSS & Other Applications

3. Requesting a PRN Number Assignment

3.1. In order to request one or more PRN numbers, an applicant must provide the applicant and system information by filling out the "Application for PRN Number Assignment" found on the GPSW PRN Website and included in Appendix A. Once the request is complete the applicant should mail the request to the GPSW at smc.gp.prn@losangeles.af.mil. During the PRN Number Assignment Process, the GPSW will review the submitted data and may request additional information. The assignment process generally will require three to six weeks following proper submission of all required information. If the review results are satisfactory, the GPSW will issue a PRN Number Assignment (Preliminary or Final as discussed in Section 5). If there are concerns about mutual interference or other interactions, the GPSW will contact the applicant to initiate more in-depth discussions.

3.2. If a specific PRN number is requested, every attempt will be made to issue that specific PRN number. Once the PRN Number Assignment has been made, updates to the C/A, L2C, and L5 PRN Code Assignment Tables will be published on the GPSW PRN Website at http://gps.losangeles.af.mil/prn/.

4. Filing with Appropriate Spectrum Regulatory Agencies

4.1. It is the responsibility of the applicant's sponsoring administration to file with the appropriate spectrum regulatory agencies for its radio frequency transmissions. These may include the International Telecommunication Union (ITU), the host administration's domestic spectrum regulatory agency, and other administrations as required.

5. Obtaining and Renewing GPSW PRN Number Assignments

5.1. As indicated in Section 3, specific PRN numbers will be issued upon successful completion of the PRN Number Assignment Process, including any necessary frequency coordination between the GPSW and the applicant. The PRN Number Assignments are either Preliminary or Final. Issued PRN Number Assignments will be identified as Final if the GPSW review result is satisfactory and the GPSW has received a published ITU Notification filing for the satellite system or other appropriate regulatory agency publication for the system that will utilize the PRN code(s). Otherwise, only a Preliminary Assignment is granted. Preliminary PRN Number Assignments expire three years after issuance whereas Final PRN Number Assignments need to be renewed 10 years after issuance, as described in the next paragraph. This renewal process provides an opportunity to ascertain that the codes and sequences are still being used, and to recover them for reissue if they are no longer being used.

5.2. A year before expiration of a PRN Number Assignment, applicants desiring to renew their PRN Number Assignments should contact the GPSW to initiate the renewal process. Renewal of a PRN Number Assignment requires resubmitting the application information to the GPSW with updates to any information that has changed.

5.3. In addition to the above, under special cases of testing purpose, a PRN assignment may be made on a temporary basis for a 6-month or 1-year period. If the PRN request is only for testing, the application must provide additional information detailed in Appendix A.

5.4. Whenever any information filed with the GPSW has changed, the applicant should contact the GPSW and provide the updated information as soon as possible.

6. Contacting the GPSW

6.1. The GPSW Systems Engineering Division (GPSW/EN) is the process owner of the PRN code assignment process. Applicants can contact the GPSW with any comments or questions at smc.gp.prn@losangeles.af.mil.

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Appendix A – Application for PRN Number Assignment Request

In order to initiate the PRN Number Assignment Process, an applicant must provide the applicant and system information by (1) filling out the "Application for PRN Number Assignment" located on the GPSW PRN Website and (2) emailing the completed application to the GPSW at smc.gp.prn@losangeles.af.mil. NOTE: The application located on the GPSW PRN Website may be completed and submitted electronically. A copy of the application is included in this appendix, but it is not interactive and cannot be completed electronically.

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APPLICATION FOR PRN NUMBER ASSIGNMENT

DATE

TO GPSW/EN
483 North Aviation Blvd.
El Segundo, CA 90245-4659
USA
Fax +1-310-653-3676
Email smc.gp.prn@losangeles.af.mil

Submit by Email

APPLICANT'S INFORMATION

1. FIRST NAME	2. FAMILYNAME	3. MIDDLE NAME

4. TITLE	5. ORGANIZATION

6. ADDRESS 1	7. ADDRESS 2
CITY STATE ZIP CODE COUNTRY	CITY STATE ZIP CODE COUNTRY

8. TELEPHONE	9. FAX	10. E-MAIL

SYSTEM INFORMATION

11. SYSTEM NAME (if any)	12. SPONSORING GOVERNMENT

13. ORGANIZATION/DEPARTMENT	14. DATE OR ANTICIPATED DATE OF ITU (or other regulatory agency) FILING

15a. QUANTITY OF PRNs REQUESTED	15b. PRN NUMBER(S) IF YOU HAVE PREF- ERENCE; OTHERWISE INDICATE 'NONE'

16. SATELLITE ORBIT PARAMETERS

16. SATELLITE ORBIT PARAMETERS	16a. SEMI-MAJOR AXIS, SMA (meters)
16b. ECCENTRICITY, e	16c. INCLINATION, i (degrees)
16d. RAAN (degrees) FOR EACH SATELLITE	16e. ARGUMENT OF PEDIGREE (degrees)
16f. MEAN ANOMALY (degrees) FOR EACH SATELLITE	16g. UTC TIME OF EPOCH (MMDDYY HH:MM:SS)

17. MAXIMUM RECEIVED ISOTROPIC POWER (dBW) ON SURFACE OF EARTH

17a. L1 C/A	
17b. L2 CL	17c. L2 CM
17d. L5 I5	17e. L5 Q5

18. RECEIVED ISOTROPIC POWER (RIP) ON SURFACE OF EARTH AS A FUNCTION OF ELEVATION ANGLE

18a. L1 C/A

Elev Angle (degrees)	-5	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90
RIP (dBW)																				

18b. L2 CL

Elev Angle (degrees)	-5	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90
RIP (dBW)																				

18c. L2 CM

Elev Angle (degrees)	-5	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90
RIP (dBW)																				

18d. L5 I5

Elev Angle (degrees)	-5	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90
RIP (dBW)																				

18e. L5 Q5

Elev Angle (degrees)	-5	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90
RIP (dBW)																				

19. REMARKS

20. PRN NUMBER REQUEST FOR TESTING PURPOSES ONLY (use additional pages if necessary)

In special cases, PRN assignments are made on a temporary basis for a 6-month or 1-year period for testing purpose only. If the PRN request is only for testing purpose the following additional information should be provided before the PRN assignment is made.

20a. PROPOSAL/TEST DESCRIPTION
Please provide a short test description clarifying details of your operations and what you hope to accomplish from the test.

20b. POWER LEVELS AND MODE OF OPERATIONS
Effective Isotropic Radiated Power (e.i.r.p.), dBW.

20c. TRANSMIT ANTENNA GAIN PATTERN

20d. PULSED MODE

pulse duty cycle

pulse repetition rate

20e. INTERFERENCE ANALYSIS
Describe measures taken to avoid interference and details of interference analysis done.

21. COMMENTS/SPECIAL REQUESTS